

FAA National Satellite Test Bed

WAAS SPS Summary User Guide

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Standard Positioning Service (SPS) Summary

WAAS Web Application

Overview of Standard Positioning Service (SPS) Summary

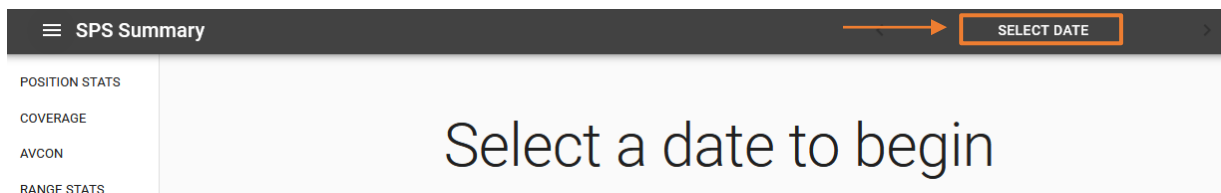
As part of the William J. Hughes Technical Center WAAS Test Team website (www.nstb.tc.faa.gov), the WAAS Web Application Portal allows you to view The Standard Positioning Service (SPS) Summary. The SPS Summary portion of this website allows you to:

- View all SPS statistics for any dates you choose (up to 6 years in the past)
- View Position Errors, AvCon failures, Data outages, and SPS Range.

The SPS Summary web application can be found at [this link](#) or by navigating to the [NSTB site](#) and following the “SPS Summary” link under the “Web Tools” section in the sidebar.

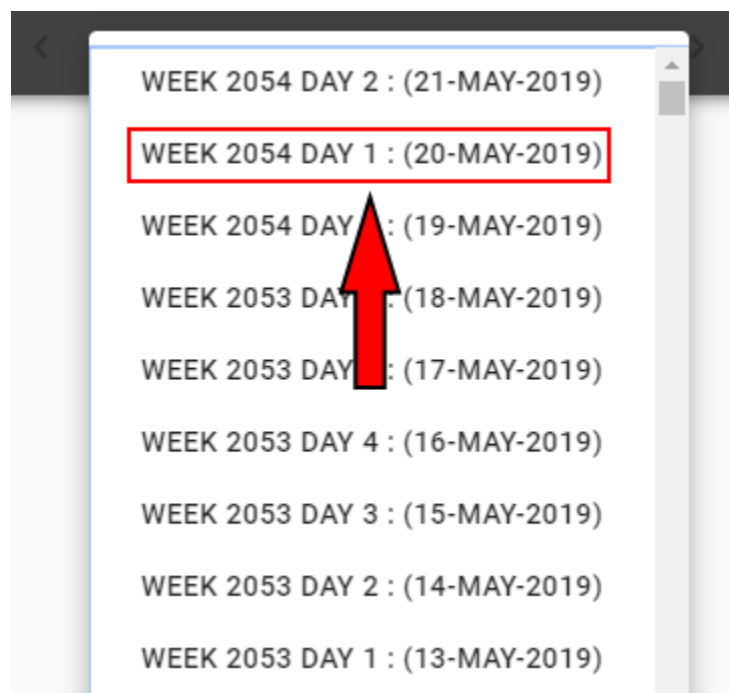
Bringing Up a Daily Summary

To use the SPS Summary the first step is to select a date.



Clicking the highlighted button will reveal a drop-down menu of dates. When the user has clicked on a link, the application will load all relevant data for the selected date.

Once you choose a date, the following screen will appear. In this case, we chose Week 2054 Day 1: (20-May-2019). This means it is from a Tuesday 2054 weeks since the GPS epoch (See the red arrow).



SPS Summary Sections

Position Stats

The Position Errors section shows receiver-specific errors. These are errors in which the position solution tool is using Standard Positioning Service (SPS) mode. The position solution tool calculates the horizontal and vertical position errors for each receiver location. The first table shows the maximum and minimum error statistics among all receivers in meters.

Statistic	Vert City	Vert Error	Horz City	Horz Error
Max 95	Los Angeles	4.27	Honolulu	3.28
Max Error	1Prescott	5.35	Honolulu	3.81
Max DOP	Fairbanks	4.82	Fairbanks	2.37
Global 95	---	2.81	---	1.45

The SPS Max errors for each receiver are shown in the second table. The highlighted values are values that exceed the threshold of the error mean added to twice the standard deviation.

SPS RNP0.3 Position Max ↓									
RCVR	ID_HEX	CITY	HDOP	VDOP	VERT Error	HPE RNP0.3	HRATIO RNP0.3	Test Stat	Test Stat Thresh
272	0110	Atlantic City-G3A-L1L2	1.56	2.53	3.80	1.78	0.026	0.49	0.08
276	0114	Atlantic City-G3B-L1L2	1.85	2.80	3.59	2.06	0.036	0.39	0.06
277	0115	Atlantic City-G3B-L1L5	1.89	5.37	7.09	5.22	0.039	0.48	0.08
304	0130	Atlantic City-a	2.62	2.56	3.19	1.84	0.029	0.40	0.06
368	0170	Atlantic City	1.71	2.61	3.94	2.27	0.037	0.53	0.09
368	0170	Atlantic City	1.71	2.61	3.94	2.27	0.037	0.53	0.09
4208	1070	Prescott	1.33	3.79	6.20	2.88	0.054	0.46	0.07
4976	1370	Arcata	1.61	3.19	5.87	2.92	0.050	0.39	0.06
12400	3070	Oklahoma City	1.93	2.61	5.14	2.85	0.056	0.54	0.09
27329	6AC1	Billings	1.47	2.15	4.09	2.09	0.031	0.41	0.06
27585	6BC1	Albuquerque	1.48	2.37	4.07	1.74	0.034	0.38	0.06
27841	6CC1	Anchorage	1.39	2.07	4.06	2.55	0.026	0.34	0.05
28353	6EC1	Boston	1.57	2.32	3.08	1.48	0.023	0.37	0.06

Coverage

The coverage data shows statistics and coverage for both the WAAS North American Service area and globally. The WAAS North American Service area is outlined in magenta in the SPS RAIM RNP plots. SPS RAIM RNP service levels are determined by their horizontal alert limit:

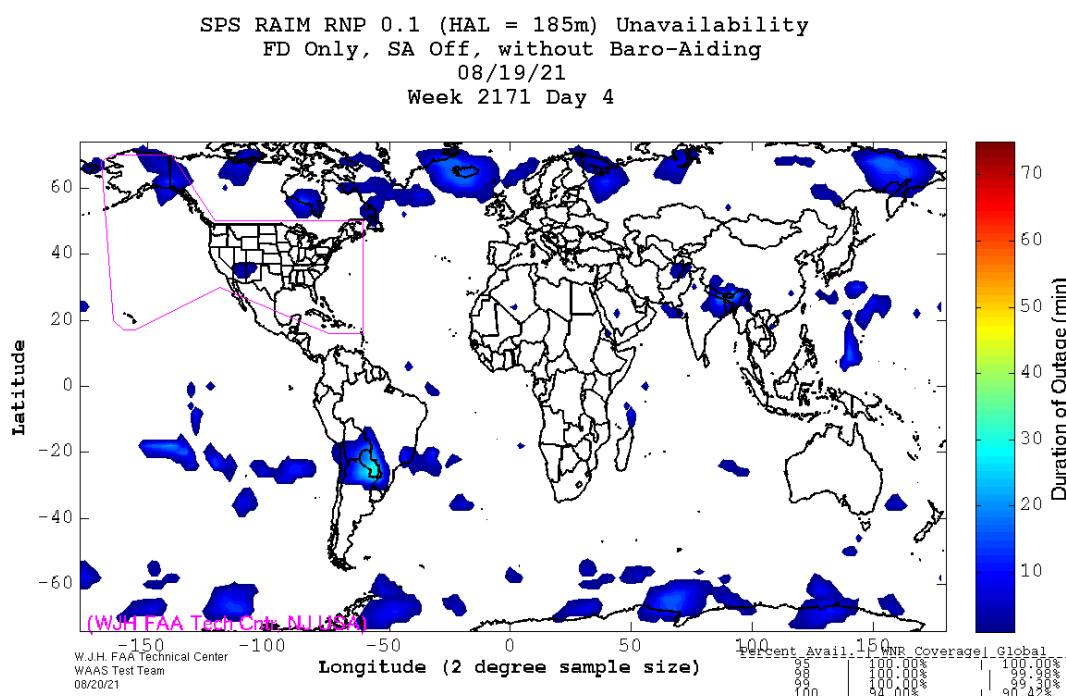
Service Level	HAL (meters)
RAIM RNP 0.1	185
RAIM RNP 0.2	370
RAIM RNP 0.3	556
RAIM RNP 1.0	1852

The first table in this section displays a summary of coverage stats for RAIM RNP 0.1, 0.2, and 0.3.

Service	100% NAS	100% GLOBAL
RNP0.1	94	90.422
RNP0.2	100	99.874
RNP0.3	100	100

Using RNP 0.1 (the top row) as an example, it means 100% of the North American Service area had RNP 0.1 availability for 94% of the day. The global service area had 100% availability for 90.422% of the day.

See below an example of a RAIM RNP plot:

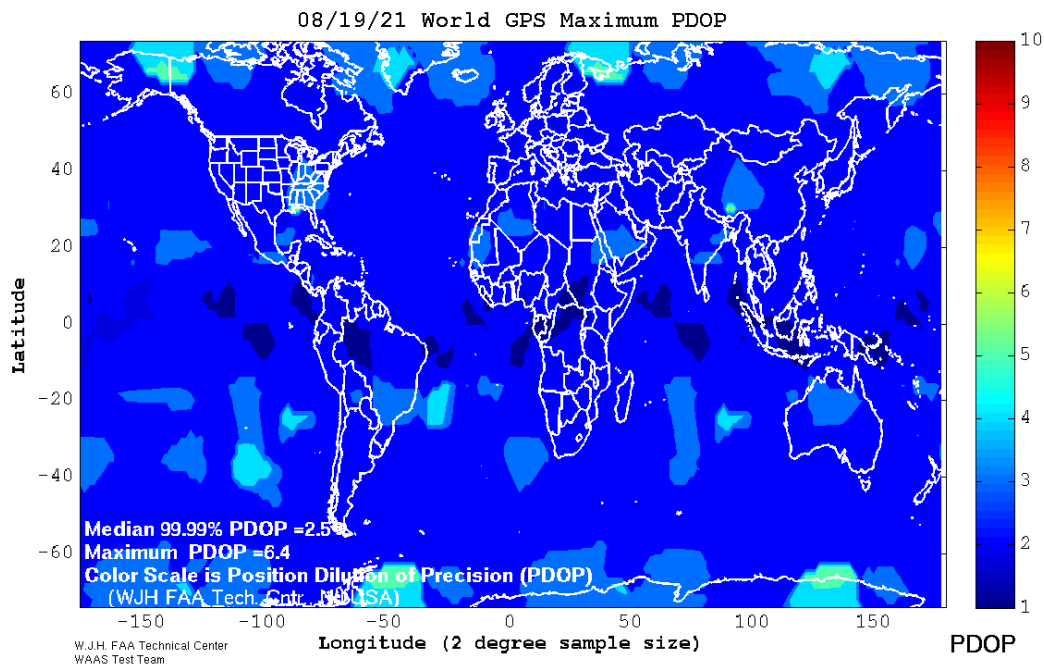


The table in the bottom right corner of the image displays expands upon the coverage summary table.

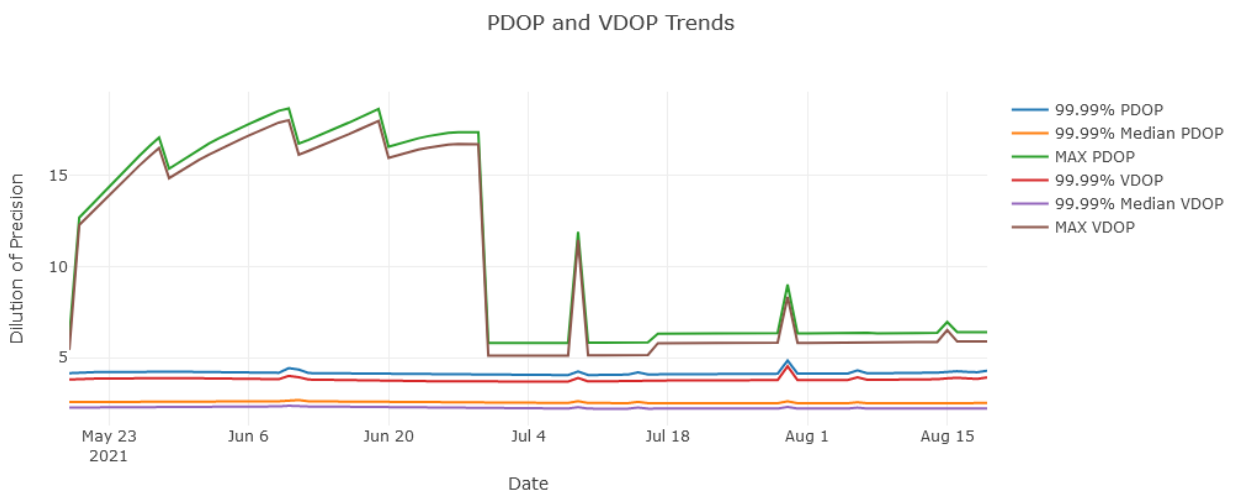
Percent Avail.	PWNR Coverage	Global
95	100.00%	100.00%
98	100.00%	99.98%
99	100.00%	99.30%
100	94.00%	90.42%

Using the outlined row as an example, it means 99% of the North American Service area had RNP 0.1 availability for 100% of the day. The global service area had 99% availability for 99.30% of the day.

The final two coverage plots display the world maximum Positional Dilution of Precision (PDOP) and Vertical Dilution of Precision (VDOP). These are dimensionless values which represent the geometry of the GPS constellation at a specific point.




Below the coverage plots is a daily trend plot tracking PDOP and VDOP.



AVCON

The Availability Continuity, or “AVCON” section, displays data about a receiver’s availability taking into account the continuity of actual outages. This section shows tables for RAIM RNP 0.1, RNP 0.2 and RNP 0.3. The rows are highlighted yellow if the receiver does not meet its thresholds, exceeds the number of outages, or drops below the expected AvCon. For example, below, Fairbanks had one outage compared to the baseline 0 outages. As a result it was highlighted yellow.

These thresholds are computed every 30 days to reflect dynamic variables for each receiver, such as GPS constellation changes or changes to the WAAS. When analyzing data for a particular day, the receiver will be compared to the threshold for the time period of the selected day only.


RNP 0.1 AvCon 				
CITY	OUTAGES	OUTAGE THRESHOLD	AVCON	AVCON THRESHOLD
Prescott	1	0	0.99423	0.9943
Albuquerque	1	0	0.99608	0.9952
Fairbanks	1	0	0.998	0.9975

The second table displays the individual outages of each receiver. It provides the Start and End times as well as the duration of each outage.

RNP 0.1 Outage Times 			
CITY	START TIME	END TIME	DURATION
1Prescott	00:31:49	00:37:23	334
Albuquerque	00:32:43	00:35:51	188
Fairbanks	17:47:14	17:47:36	22

Range Stats

The range stats section displays the range errors for each satellite for a subset of our evaluated receivers. These receivers were chosen as a representative group of typical performance in various regions of the WAAS service area. The table in this section highlights the max errors for each receiver.

SPS Range Max Errors							
SAT	BOSTON	LA	MIAMI	JUNEAU	MERIDA	HONOLULU	
1	2.05	3.09	1.66	2.04	2.41	4.98	
2	2.35	4.16	2.18	2.62	2.29	4.61	
3	3.07	1.90	1.91	2.50	2.39	5.68	
4	1.77	1.58	2.37	1.38	2.13	5.15	
5	1.92	2.83	2.05	1.71	2.14	2.47	
6	2.81	2.95	1.17	2.13	1.43	5.87	
7	2.32	2.43	2.27	1.89	2.63	2.74	
8	2.66	2.32	3.57	2.09	2.82	3.78	
9	1.61	2.32	2.74	1.69	2.59	4.14	
10	1.52	2.14	2.46	2.15	2.44	1.66	
11	0.00	0.00	0.00	0.00	0.00	0.00	
12	1.56	1.56	1.39	1.27	1.39	2.26	
13	3.02	3.79	2.20	1.72	2.10	2.16	
14	2.23	3.34	1.83	1.69	2.10	5.78	
15	1.71	3.85	3.20	1.20	1.40	1.92	
16	3.26	3.54	4.14	1.76	3.39	5.01	
17	2.31	4.32	3.26	2.59	3.20	4.47	
18	2.02	3.14	2.88	2.43	2.58	2.32	
19	2.01	5.78	3.25	3.55	3.50	5.62	

SV Corrections

In SPS mode, correction messages aren't taken into account. However, it is useful for us to look at the corrections alongside the SPS errors. The table in this section provides the correction data alongside the corrected errors. The max values for each column are highlighted in yellow. The user can change which GEO corrections to view with the buttons above the table.

GEO 131

GEO 133

GEO 138

SAT	SAMPLES	95% Error	98% Error	MAX Error	AVG Error	STD DEV	Clock 99%	Clock STD DEV	Long 99%	Long STD DEV
1	7398	1.68	2.13	2.36	-0.30	0.53	4.44	1.72	3.24	1.40
2	7246	1.71	2.29	2.80	-1.35	0.23	2.43	0.78	2.72	0.75
3	7289	1.32	1.40	1.51	0.68	0.56	2.91	1.12	2.44	1.08
4	4313	2.26	2.69	3.00	-0.43	0.80	6.43	2.03	6.19	2.26
5	7161	1.34	2.26	2.57	-0.67	0.42	1.89	0.82	2.75	0.90
6	7147	1.04	2.85	3.67	-0.26	0.52	3.79	1.40	3.05	1.22
7	7025	2.51	2.64	2.78	-1.19	0.66	1.43	0.68	2.99	0.82
8	7288	1.40	1.54	1.68	-0.71	0.56	3.58	1.13	2.65	1.27
9	7106	1.59	1.92	2.56	-0.90	0.34	2.88	1.03	3.43	0.98

Edits

This section displays times that receivers were not included in our monitoring and statistics. This is typically done when a receiver malfunctions. Since these times are not indicative of the true performance of the system, they are edited out of the dataset.

CITY	RCVR	TOW	NAV	SAT_VALID	FLAG	HPL	VPL	PDOP
1Atlantic City-G3A-L1L2	272	367713	1	6	2	206	257	3
1Atlantic City-G3A-L1L2	272	367714	1	6	2	205	257	3
1Atlantic City-G3A-L1L2	272	367715	1	6	2	205	257	3
1Atlantic City-G3A-L1L2	272	367716	1	6	2	205	257	3
1Atlantic City-G3A-L1L2	272	367717	1	6	2	205	257	3
1Atlantic City-G3A-L1L2	272	367718	1	6	2	205	258	3
1Atlantic City-G3A-L1L2	272	367719	1	6	2	205	258	3
1Atlantic City-G3A-L1L2	272	367720	1	6	2	205	258	3
1Atlantic City-G3A-L1L2	272	367721	1	6	2	205	258	3
1Atlantic City-G3A-L1L2	272	367722	1	6	2	205	258	3

The for performance reasons, the application truncates the list of edits. The user can click “SHOW ALL EDITS” to expand the table.